Research Article

The knowledge about autonomic dysreflexia among nursing and physiotherapy students

Nada Strčić[1,2], Dean Markić[3,4]

[1]Faculty of Health Studies, University of Rijeka, Rijeka, Croatia, [2]Special Hospital Medico, Rijeka, Croatia, [3]Faculty of Medicine, University of Rijeka, Rijeka, Croatia, [4]Department of Urology, University Hospital Rijeka, Rijeka, Croatia

Context/Objective: Autonomic dysreflexia is a clinical syndrome affecting persons with spinal cord lesions. The aim of the study was to detect the level of knowledge among students about autonomic dysreflexia in persons with spinal cord lesions.
Design: Single centre questionnaire study.
Setting: Faculty of Health Studies, Rijeka, Croatia.
Participants: Nursing (n = 43) and physiotherapy (n = 48) students.
Outcome Measures: AD knowledge test.
Results: More of the half of the students (57%) had contact with persons with spinal cord lesions during work, especially nursing students. The self-estimated knowledge of autonomic dysreflexia was judged as poor or none in 73.6% of students. On the autonomic dysreflexia knowledge test, nursing students collected mean of 5.6 points and physiotherapy students 4.9 points (P = 0.173). There was no difference in the autonomic dysreflexia test results regardless of work experience or group affiliation.
Conclusion: The level of knowledge about autonomic dysreflexia among students was low. Our results suggest the need for more education of students and health care professionals to apply adequate treatment to persons with episodes of autonomic dysreflexia.

Keywords: Autonomic dysreflexia, Spinal cord injury, Continuous medical education

Introduction

Autonomic dysreflexia (from the Latin word *dysreflexia autonomica* – AD) is a disorder of the autonomic nervous system that is manifested in individuals with high levels of spinal cord lesions (SCL) caused by stimuli from the skin or internal organs below the level of the lesion.[1–5] AD is most commonly found in persons who have SCL at the level of Th6 or higher but can also be found in lesions up to Th10.[6,7] The causes of SCL include spinal cord injury (the most common traumatic injuries), vascular pathology (insults, arteriovenous malformations), neoplasms, degenerative diseases (syringomyelia), and inflammatory disease (transverse myelitis, encephalomyelitis).[1,2,8,9] Episodes of AD can be triggered by many potential causes, but bladder distension and/or irritation are responsible for approximately 80% of cases.[1–6]

The most common manifestations of AD are a sudden increase of blood pressure and bradycardia. These symptoms are often accompanied by strong headache, profuse sweating and redness of the skin above the level of injury and cold and pale skin below the level of the injury. AD can lead to uncontrolled arterial hypertension and hypertensive crisis, which can become a life-threatening condition.[1,7] Untreated, it can cause cerebrovascular and cardiovascular complications and even death.[1,6,7] For this reason, people with SCL, their caregivers and health care professionals should be familiar with this syndrome.

The role of health care professionals is crucial because the delayed diagnosis and inadequate treatment of AD may result in stroke or myocardial infarction; therefore, early recognition and prompt management are very important. Their role includes not only adequate treatment and prevention but also the education of patients

Correspondence to: Dean Markić, Department of Urology, University Hospital Rijeka, Tome Strižića 3, 51 000 Rijeka, Croatia. Email: dean.markic@ri.htnet.hr

This article has been republished with minor changes. These changes do not impact the academic content of the article.

DOI 10.1080/10790268.2018.1439432

and their families. Nurses and physiotherapists are more commonly in contact with patients than other health care professionals. Testing their knowledge is the first step to better assess their knowledge about AD and to employ appropriate measures for their improvement. The aim of our study was to investigate nursing and physiotherapy students' current knowledge of AD.

Participants and methods

The investigation was performed using a survey. The participants were students of the Faculty of Health Studies in Rijeka, Croatia, at the end of their first or second year of graduate study in nursing and physiotherapy. In Croatia, the university education of nurses and physiotherapists is divided into pre-graduate study (three years) and graduate study (two years). Participants in our study were divided into two groups. The first group included students in the first and second year of graduate nursing study (43 participants), and the second group included students in the first or second year of physiotherapy graduate study (48 participants). The questionnaire was given to them during their educational hours in the classroom. A member of the research team visited students and recruited all interested students. During recruitment, the research team member provided information about the survey but not specific information about AD. In all cases, the survey was immediately completed and returned to the researcher. The questionnaire was in the Croatian language and identical for all participants. It consisted of a general, demographic section and a second section with specific questions about AD (AD knowledge test).[10] The specific section was undertaken and translated (with permission) from the questionnaire in English. The AD knowledge test was originally written and used by a group of physiatrists in Canada.[10] Their field of interest includes persons with spinal cord injury, and they are experts on AD. The knowledge test started with participants' self-assessment about their knowledge about AD. The AD knowledge test consisted of 11 questions of different types (case studies, multiple choice, and matching) that assess participants' knowledge about the aetiology, signs, symptoms and treatment of individuals with AD. The answers were scored, and the possible score ranged from 0-22. The maximum score was 22, and a higher score indicated better knowledge about AD. After finishing the survey, analysis was performed, including scoring.

The investigation was approved by the Ethical Committee for Biomedical Investigations of Faculty of Health Studies Rijeka. All the data were collected according to ethical and bioethical principles. The survey was anonymous and we protected the collected data. All participants read and signed informed consent forms and gave their permission to be included in investigation.

The statistical analysis of data was performed using Statistica 8 software (StatSoft., Inc., Tulsa, OK, USA). The results were presented in tables and figures. The statistical tests used were methods of descriptive statistics, chi-square test, Fisher's exact test and t test for independent samples. Significance was set at $P < 0.05$.

Results

The total number of participants was 91, divided into two groups as described previously.

General part of the survey

The basic demographic data is presented in Table 1. The mean age of students was 36.8 years (range 22–56 years), but the nursing students were older ($P < 0.001$). Among participants, the female sex was dominant, especially in the nursing group ($P = 0.001$). The education level was similar ($P = 0.596$), and 93.4% of all participants were employed, mostly (45%) in public clinical hospitals. Regarding work experience, 81.4% of nursing students

Table 1 General demographic and professional characteristics of the participants in the survey (N = 91).

Variable	NS (n = 43)	PS (n = 48)
Age (mean, years)	43	31.4
Sex:		
Male	3	18
Female	40	30
Education level (previously finished some other graduate study)	3	3
Employer:		
Clinical hospital	25 (58.1%)	16 (33.3%)
General hospital	3 (7.0%)	5 (10.4%)
Special hospital	6 (14.0%)	2 (4.2%)
Others (sports clubs, rehabilitation centres)	9 (20.9%)	25 (52.1%)
Work experience:		
1-5 years	5 (11.6%)	21 (43.8%)
6-10 years	0	5 (10.4%)
11-15 years	3 (7.0%)	9 (18.7%)
>15 years	35 (81.4%)	13 (27.1%)
Location of practice:		
Urban	38	43
Rural	5	5
The number of contacts with patients with SCL per month:		
1	14 (32.5%)	19 (39.5%)
2-10	10 (23.2%)	9 (18.7%)
>10	0	2 (4.2%)
0	1 (2.4%)	0
Without answer	18 (41.9%)	18 (37.6%)

NS, nursing students; PS, physiotherapy students; SCL, spinal cord lesion.

Table 2 Participants' self-assessment about their knowledge of autonomic dysreflexia.

Self-assessment (grading)	NS (%)	PS (%)	∑ (%)
Excellent	0	0	0
Good	5 (11.6)	4 (8.3)	9 (9.9)
Moderate	9 (20.9)	6 (12.5)	15 (16.4)
Poor	11 (25.5)	15 (31.2)	26 (28.5)
None	18 (41.8)	23 (47.9)	41 (45)

NS, nursing students; PS, physiotherapy students.

had more than 15 years of work experience. However, the largest physiotherapy student group (43.8%) had less than 5 years of work experience ($P < 0.001$). During work, students from both groups had contact with individuals with SCL, but more students of physiotherapy had this contact ($P = 0.956$).

Specific part of the survey

Participants' self-assessments are presented in Table 2. The self-assessment results showed no significant difference between groups (chi-square = 1.667; $P = 0.865$), and most students estimated their knowledge as none or poor.

In Table 3, we present the participants' answers in the AD knowledge test. Overall, the average AD knowledge test score was 5.25 points (range 0-17 points) of a maximum of 22 points. Nursing students had an average AD knowledge test score of 5.6 points compared to 4.9 points for physiotherapy students ($P = 0.173$). Students with work experience ≤10 years had an average AD knowledge test score of 5.4 points compared to 5.2 points in students with more than 10 years of work experience ($P = 0.447$) (Table 4).

Table 4 Average autonomic dysreflexia knowledge test score between our participants depends on working experience (the maximal score was 22).

Working experience	NS	PS	P
≤10 years	6.8	5.4	0.112
>10 years	5.4	4.8	0.24

NS, nursing students; PS, physiotherapy students, t-test.

Discussion

According to data from the National Spinal Cord Injury Statistical Center (USA), approximately 17% of patients with spinal cord injury have at least one episode of AD.[11] The prevalence rate of AD is between 48 and 90% in the patients with SCL above Th6. The higher level of the lesion is accompanied with a higher probability of AD.[11–13] All previous data suggested that AD is a relatively common clinical syndrome in the SCL population, and it must be recognized and properly treated.

In our study, we chose these two groups of professional health care students (nurses and physiotherapists) because they had a university-level education

Table 3 Autonomic dysreflexia knowledge test consist of 11 questions. In the table are presented number and percentage of correct answer on each question.

Question and correct answer	NS (%)	PS(%)	∑ (%)	P
1. AD is characterized with sudden rise in blood pressure and associated symptoms from noxious or non-noxious stimuli that trigger sympathetic hyperactivity of the spinal cord.	*9 (20.9)*	*20 (41.6)*	*29 (31.8)*	*0.043**
2. Typical resting systolic blood pressure for a person with a chronic tetraplegia is 90 mmHg.	*7 (16.2)*	*8 (16.6)*	*15 (15.4)*	*0.593*
3. In a person with spinal cord injury the lowest spinal cord segment associated with the occurrence of AD is Th6.	*13 (30.2)*	*14 (29.1)*	*27 (29.6)*	*0.546*
4. Initial steps for treating patients with the episodes of AD included to sit him up in bed, loosen any tight clothing or restrictive equipment and empty his bladder.	*8 (18.6)*	*15 (31.2)*	*23 (25.2)*	*0.227*
5. Symptoms and signs which has individual during the episode of AD are sudden increase in blood pressure, sudden low heart rate, headache and flushed skin above the lesion.	*4 (9.3)*	*2 (4.1)*	*6 (6.5)*	*0.416*
6. The two most common causes of AD are: 1. urinary bladder (distension, infection, tests) 2. gastrointestinal (constipation, hemorrhoids).	*9 (20.9)*	*9 (18.7)*	*18 (19.7)*	*0.779*
7. Medications used to lower blood pressurre are indicated in the management of patients with AD.	*21 (48.8)*	*30 (62.5)*	*51 (56)*	*0.210*
8. The most frequent used medications for lowering blood pressure in the patients with AD are captopril, nifedipine and nitroglycerine.	*0*	*0*	*0*	*/*
9. In a person with a spinal cord injury, who has experienced a severe untreated episode of AD, the possible complications are: seizures, intracranial hemorrhage, angina, myocardial infarction and death.	*6 (13.9)*	*3 (6.2)*	*9 (9.8)*	*0.298*
10. AD management protocol included: monitoring of blood pressure and heart rate for at least 2 hours after blood pressure normalizes to the expected values for the individual's injury level.	*20 (46.5)*	*21 (43.7)*	*41 (45)*	*0.835*
11. After the identification and treatment or removal of the trigger for AD, the following can be expected: hypotension, the lose of consciousness, complains of dizziness and lightheadedness.	*18 (4.8)*	*15 (31.2)*	*33 (36.2)*	*0.382*

AD, autonomic dysreflexia; NS, nursing students; PS, physiotherapy students. *P = <0.05; Fisher exact test.

and all were active health care professionals from different institutions with individual work experience (52% of participants had a working experience >15 years). Additionally, during their work activities, almost 60% of participants had a contact with 1-10 patients with SCL per month. This suggests that these two groups accurately represent the body of knowledge of AD among these specific groups.

Most of our students (73.6%) self-assessed their knowledge about AD as none or poor. In other studies that used the same questionnaire among health care professionals and nursing students, most participants rated their knowledge in these two categories (82.8% and 85.2% of participants).[10,14] It is obvious that in different countries (Canada, Croatia), present and/or future health care professionals estimated their knowledge about AD at very low levels.

The better indicator was the results of the AD knowledge test. Our students had a mean score of 5.25 points. This score is much lower than in other similar studies, where this score was 9 (participants were paramedic and nurse trainees) or 11.85 points (participants were emergency health care professionals).[10,14]

Comparing the results of the AD knowledge test between our two groups, there was no significant difference between them, but nursing students had a slightly higher knowledge (5.6 points versus 4.9 points). The physiotherapy students spent more time with SCL patients during work, but nursing students had a longer duration of work experience (>15 years – 82% of nursing students). These data indicated that our nursing students had a longer delay from regular education but also more work experience compared to physiotherapy students. Both can be responsible for this slight difference between the groups. However, the major issue of the overall low score is insufficient education about AD during regular education, including the level of high school, university level (pre-graduate and graduate level) and postgraduate education. In Croatia, both professional groups require postgraduate education, but neither one has autonomic dysreflexia as a thematic issue. Comparing the results of the AD knowledge test, work experience was not different (Table 4). This suggests that education about AD is not adequate.

One of the possible reasons for these results may be that neither of our participant groups worked in the emergency department (hospital or prehospital). Health care workers in the prehospital and hospital emergency department are first to contact these patients and their knowledge is likely better. Still, most of our students have contact with persons with SCL in the workplace, and nurses and physiotherapists are likely to meet patients with episodes of AD. Our data showed that our participants, instead of relatively long working experience, do not have sufficient knowledge to recognize symptoms of AD (or that they are caused by AD) and how to start appropriate treatment. All this suggest that, in most cases, the ability to manage patients with AD does not exist. In this way, there is a real possibility that because of inappropriate management, the health and life of these patients may be endangered.

The use of seminars and online modules is an effective educational method that is frequently used in the education of health care professionals. The group from Canada developed an online education tool called "The ABCs of AD".[10,14,15] This online seminar is developed as part of project to transfer knowledge from clinicians and scientists (experts in AD) to health care professionals to improve their knowledge and management of patients with AD. Tomasone *et al.* tested this online educational module to improve AD knowledge among paramedic and nurse trainees.[14] The trainees' average AD knowledge test score before the educational intervention was 9.00 points, and after the online seminar, it increased to 12.03 points. It was obvious that "The ABCs of AD" significantly increased the participants' knowledge about AD. Krassioukov *et al.* presented their experience with the efficacy and duration of "The ABCs of AD" to increase the knowledge of AD among emergency health care professionals.[10] The initial score on the AD knowledge test was 11.85 points, and after the educational intervention, it increased to 18.95 points. After the three-month seminar, the average score was 17.04 points, and the authors concluded that this seminar improved AD knowledge in the short-term but additional active learning strategies must be included to enhance knowledge in the long-term.[10]

In Croatia, the incidence of traumatic SCL is $20/10^6$ inhabitants, e.g., approximately 100 new patients each year, with approximately the same number of non-traumatic patients.[16] Approximately 52% of patients have tetraplegia, and most of them are 16-30 years old.[17] Currently, Croatia has approximately 3500 patients with traumatic injury of the spinal cord.[17] The literature about AD in the Croatian language is very scarce.[18] From our results, it is obvious that knowledge about AD is insufficient among nurses and physiotherapists. It is essential that adequate educational measures at the national level be undertaken. It can be divided depending on the education level. On the graduate level, it can be included in the curriculum of some already existing courses and/or by establishing an

elective course (for example, in the course in which the main topic is patients with spinal cord injuries). On the postgraduate level, these measures can include courses, seminars, and webinars. These educational interventions are generally effective methods for increasing knowledge about a specific medical condition and a preferred method for continuing medical education among health care professionals.[10] The influence of educational interventions on professionals' knowledge and changes in practice behavior may be enhanced with a focus on outcomes that are perceived as serious, such as the consequences of improper AD management.[10]

In the past, the life span of patients with SCL was significantly lower than that of the general population. Knowledge on the medical needs of these patients was relatively low and was restricted to specialized centres only. This may be a reason why the appropriate education about the health care of SCL patients was inadequate at all educational levels in the past. Currently, improvements in the medical treatment of this patients and better medical and social care have improved their health and significantly prolonged their life span. Additionally, these patients are treated by many specialists at different levels of the health care system. Since the number of these patients has increased and will increase in the future, it is very important that health care professionals be educated about this specific group of patients. Additionally, the educational institutions and professional organizations must recognize this problem and implemented education about SCL patients in the educational curriculum.

The importance of this study was that for the first time in Croatia, we tested the knowledge of health care students about AD. Additionally, this is the first European study to test the knowledge about AD. Although Europe has many countries with different health systems and different economic levels, we believe that the results across Europe will be similar to ours, especially in south-eastern Europe. Using a specific tool, such as the AD knowledge test, can help to better compare the level of knowledge between different countries.

Our results must promote endeavors to increase specific knowledge. These educational measures may include seminars, online modules or courses about AD (similar to courses for cardiopulmonary resuscitation) with the main aim of improving the knowledge of health care professionals. The main goal is that AD episodes in patients with SCL are recognized quickly and properly treated.

The main limitation of our study is that is a single-institution study. Most participants were from two counties in Croatia. A multi-institutional study would better present the current AD knowledge among health care professionals across Croatia.

Conclusion

This study suggests that the level of knowledge about AD is very low in our group of health care professionals. Educational measures to improve the knowledge about AD must be implemented at the national level. The target population must be all health care professionals, persons with SCL, their families and caregivers.

Disclaimer statements

Contributors None.

Funding statement No funding received.

Declaration of interest None.

Conflicts of interest The authors report no conflicts of interest.

Ethics approval None.

ORCID

Dean Markić http://orcid.org/0000-0001-5696-0850

References

1 Furlan JC. Autonomic dysreflexia: a clinical emergency. J Trauma Acute Care Surg 2013;75(3):496–500.
2 Bauman CA, Milligan JD, Lee FJ, Riva JJ. Autonomic dysreflexia in spinal cord injury patients: an overview. J Can Chiropr Assoc 2012;56(4):247–50.
3 Hou S, Rabchevsky AG. Autonomic consequences of spinal cord injury. Compr Physiol 2014;4(4):1419–53.
4 Berger MJ, Hubli M, Krassioukov AV. Sympathetic skin responses and autonomic dysfunction in spinal cord injury. J Neurotrauma 2014;31(18):1531–9.
5 West CR, Squair JW, McCracken L, Currie KD, Somvanshi R, Yuen V, *et al.* Cardiac consequences of autonomic dysreflexia in spinal cord injury. Hypertension 2016;68(5):1281–9.
6 Milligan J, Lee J, McMillan C, Klassen H. Autonomic dysreflexia: recognizing a common serious condition in patients with spinal cord injury. Can Fam Physician 2012;58(8):831–5.
7 Wan D, Krassioukov AV. Life-threatening outcomes associated with autonomic dysreflexia: a clinical review. J Spinal Cord Med 2014;37(1):2–10.
8 Pineau C, Lavrard B, Boyer F, Percebois-Macadre L. Inaugural hyperhidrosis revealing syringomyelia in a spinal cord injured men T10 AIS A. Ann Phys Rehabil Med 2016;59:129. doi:10.1016/j.rehab.2016.07.290. Accessed: 20/October/2016.
9 Jayakrishnnan MP, Krishnakumar P, Gauthamen R, Sabitha S, Devarajan E. Autonomic dysreflexia in acute disseminated encephalomyelitis. Pediatr Neurol 2012;47(4):309–11.
10 Krassioukov A, Tomasone JR, Pak M, Craven BC, Ghotbi MH, Ethans K, *et al.* "The ABCs of AD": a prospective evaluation of the efficacy of an educational intervention to increase knowledge of autonomic dysreflexia management among emergency health care professionals. J Spinal Cord Med 2016;39(2):190–6.
11 Helkowski WM, Ditunno JF Jr, Boninger M. Autonomic dysreflexia: incidence in persons with neurologically complete and incomplete tetraplegia. J Spinal Cord Med 2003;26(3):244–7.

12 Curt A, Nitsche B, Rodic B, Schurch B, Dietz V. Assessment of autonomic dysreflexia in patients with spinal cord injury. J Neurol Neurosurg Psychiatry 1997;62(5):473–7.
13 Krassioukov AV, Furlan JC, Fehlings MG. Autonomic dysreflexia in acute spinal cord injury: an under-recognized clinical entity. J Neurotrauma 2003;20(8):707–16.
14 Tomasone JR, Martin Ginis KA, Pulkkinen W, Krassioukov A. The „ABCs of AD": a pilot test of an online educational module to increase use of the autonomic dysreflexia clinical practice guidelines among paramedic and nurse trainees. J Spinal Cord Med 2014;37(5):598–607.
15 Jackson CR, Acland R. Knowledge of autonomic dysreflexia in the emergency department. Emerg Med J 2011;28(10):866–9.
16 Moslavac S, Džidić I, Moslavac A, Vlahek P, Filipan Z. Urinary tract dysfunction in spinal cord injury patients. Liječ Vjesn 2014; 136(5–6):147–52.
17 Schnurrer-Luke-Vrbanić T, Moslavac S, Džidić I. Spinal cord injury rehabilitation. Medicina Fluminensis 2012;48(4): 366–79.
18 Markić D, Šimičić J, Strčić N, Trošelj M, Grubišić I, Bonifačić D. Autonomic dysreflexia. Liječ Vjesn 2017;139(1–2):38–44.